QA check during treatment and this study is preliminary to DC use for in vivo dosimetry.

EP-1392

Validation of total skin electron irradiation technique dosimetry data by Monte Carlo simulation

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Purpose/Objective: Total Skin Electron Irradiation (TSEI) is a complex technique which requires non-standard measurements and dosimetric procedures. At our center, the six-dual-field approach is implemented for this treatment. The purpose of this work is to validate the measured dosimetry data by Monte Carlo (MC) simulations.

Materials and Methods: 6 MeV beam from Elekta Precise linac operated in High-Dose-Rate (HDR) mode is used fort TSEI treatments. The EGSnrc code package was used for MC simulation. First, the incident electron beam parameters (energy spectrum, FWHM) were adjusted to match the measured data (PDD and profile) at SSD=100 cm for 40x40 open field. These parameters were then used to calculate dose distributions at the treatment distance of 400 cm. BEAMnrc code was used to generate the phase-space file in a plane at the exit from the linac head (at the mylar). This file was used in DOSXYZnrc code to calculate PDDs, profiles and output in a water phantom at SSD= 400 cm from a single beam. Optimal gantry angle was determined. Full treatment with 6 dual fields was simulated on the CT-based anthropomorphic phantom. MC calculations were compared with the available set of measurements used in clinical practice.

Results: The results of our Monte Carlo calculations were found to be in general agreement with the measurements, providing a promising tool for further studies of dose distribution calculations in TSEI. For one direct field at the treatment distance, calculated PDD was within 3%/1mm agreement and calculated profile was within 2% agreement with the measurements. The calculated output at the treatment distance was 3% lower than the measured output. The optimal gantry angle providing the best flatness of the surface dose was confirmed to be 17 degrees. Depth doses for the full treatment calculated in the anthropomorphic phantom agreed with the measurements within 3%/1mm.

Conclusions: The measured dosimetry data used for TSEI calculations are validated by MC simulations. This work also indicates that simulations can complement and/or replace extensive experimental measurements needed for commissioning of TSEI technique.

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A quick measure equipment characterization for the comissioning of Varian¥s Enhanced Dynamic Wedges

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Purpose/Objective: For the comissioning as well as for the quality control (QC) of enhanced dynamic wedges (EDW) two devices are commonly used: a system of linear waterproof detectors for relative dosimetry verification, and ionization chambers for the verification of wedge factors. Hereby we study the posibility of executing this process with a quick measure equipment.

Materials and Methods: The PTW StarCheck device is a linear arrangement of small volume ionization chambers (0.053 cc) separated 3 mm (except central chamber and the second chamber) in the left-right and head-feet directions. The manufacturer provides the equipment with a calibration energy Cobalt factor and a calibration matrix which adjusts the gain of the other cameras respect the central chamber. We compared the values obtained with the ionization chamber and StarCheck for energies of 6 MV and 18 MV (measurement conditions: SSD 100 cm and depths 5 cm and 7 cm respectively):

- EDW factors for all angles for the fields: 4x4 cm^2, 10x10 cm^2, and 20x20 cm^2.
- EDW angle obtained with the Schmidt method for all possible combinations of wedge angles and field size.
- Wedge angle independence depending on the orientation of the wedge.

Finally, we evaluated the effect of interrupting the execution of the dynamic wedge by comparing radiation without interruption against the added amount of radiation interrupted for different values of monitor units: 25, 50, 100 and 200.

Results: The StarCheck response linearity is brilliant: linear correlation coefficient of 0.999998 for the reading in the central chamber vs the Farmer camera with readings in the range from 2 to 400 UM. The equivalent depth obtained is 8.9 mm compatible with the value of 8.5 mm supplied by the manufacturer. StarCheck obtained EDW factors are within 0.5% compared to those obtained with the reference Farmer camera for all combinations of energy (6 MV and 18), fields (4x4, 10x10, 20x20 cm2) and wedge angle (10, 15, 20, 25, 30, 45 and 60). The wedge angles measured by StarCheck match, with a maximum difference of 1 degree, those obtained with a Semi-Flex camera in a water phantom for all wedges and fields 10x10 cm^2 and 20x20 cm^2. Considerable differences in the angles have been obtained between StarCheck and semi-flex camera for dynamic wedges below 30 degrees and the field 4x4 cm^2. The interruptions analysis shows that in treatments with EDW with less than 50 UM a disruption can cause an over-dose of approximately 2%, regardless of whether the interruption occurs during static wedge phase or during the movement of the jaw and regardless of the angle wedge.

Conclusions: This study allows us to assure that it is possible to achieve a significant part of the comissioning of EDW with just a quick measurement device.

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VMAT patient-specific QA with 2D-array seven29/Octavius system: a retrospective analysis on 1000 patients

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